





Survey on Agile and Lean Usage in Finnish Software Industry

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- 4. Conclusions, Limitations and Future work





Agile Software Development

2001

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Agile and Lean Software Development

Study Design

Results

Conclusions, Limitations and Future work

Source: Agile Manifesto, 2001 http://agilemanifesto.org/ Manifesto for Agile Software Development





Agile Software Development



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Scaling Agile Software Development





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Why Learn from Lean Thinking?

Agile and Lean Software Development

Study Design

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Conclusions, Limitations and Future work

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Improved profitability and productivity. Toyota cut \$2.6 billion out of \$113 billion manufacturing costs, without closing a single plant in 2002. Toyota led in global automobile sales until 2011.

• Faster time-to-market. Zara reduced lead time via a business model based on Lean. It delivers new items 12 times faster than its competitors and launches 30000 designs each year (as opposed to 2000–4000 introduced by competitors)

• Improved product quality and customer satisfaction. Toyota Lexus CT200h recently received the maximum rating under the Japanese overall safety assessment (Source: 2011 Japan New Car Assessment Program)

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Lean Paradigm

Shift From Mass-production to Lean-production



Lean Software Development

Agile and Lean Software Development

Study Design

Results

Conclusions, Limitations and Future work "If Lean is thought of as a set of principles rather than practices, then applying lean concepts to product development and software engineering makes more sense and can lead to process and quality improvements."

(Source: Poppendieck M, Cusumano MA. Lean software development: a tutorial, Software, IEEE , 29(5): 26-32, Sept.-Oct. 2012) Aaile Manifesto Japanese auto Efficiency industry: First discussions of Lean in higher-quality cars, at Software Domain half cost, in half time Lean Software τογοτα Development Five principles of **Toyota Production** IMVP Flexibility + Lean System (TPS) International Motor Efficiency 1939-1945 World War III Vehicle Program

1980

1990

2000

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1940

1960

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2010

Research on Agile and Lean Software Development



Study Design

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- The relationship between ASD and LSD has not been clearly defined, limiting the current comprehension of the phenomenon
- To our best knowledge, there are not studies exploring the level of Lean adoption in software development



Research Objectives and Questions

Agile and Lean Software Development

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Study Design

uture work

Results

- To provides more generalizable and up-to-date results on the state of ASD and LSD usage in the real-world industry
- 2. To identify most applied methods and practices as well as most experienced benefits and challenges on using ASD and LSD
 - RQ1: What is the **current state of adoption** and usage of ASD and LSD methods and practices in the software industry?
 - RQ2: What are the **reasons why ASD and LSD are being adopted** in some software development organizations?
 - RQ3: Which are the impacts, in terms of benefits, of using ASD and LSD?
 - RQ4 :Which are the **limitations and factors that can challenge** the usage of ASD and LSD?
 - RQ5: Which are the **reasons of some organizations for not using** ASD and LSD?



Study Design



Study Design

Results

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¹Source: Business Software Alliance. 2011. Investment for the Future Benchmarking IT Industry Competitiveness Report.

- Conducted among Finnish software practitioners in 2011
 - Finland takes up the second position in the IT Industry Competitiveness Index 2011 of the BSA/Economist's report¹
- Sampling frame: Finnish Information Processing Association (FIPA)



408 responses from 200 companies collected (response rate: 9%)

Extensive exploratory web survey study, including almost fifty questions



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Limitations and Future work

Stud

Results

Background information of the participants

Software	Position	s in o	rgani	zation		Experier	ce in software deve	lopment
Development	 Position	n		Position	n	Years of experience	n	%
	Developer	113		Scrum master	33	None	42	10,3
Study Design	Project manager	99		Process manager	31	Less than 2	31	7,6
	IT staff	79		Product owner	25	2-5	56	13,7
	Architect	63		Product manager	23	5-10	80	19,6
Results	Consultant/Trainer	52	Presi	dent/VP/CEO/COO/CIO/CTO	22	10-20	144	35,3
	Quality assurance/Tester	38		Sales/Marketing personnel	10	More than 20	55	13,5
Conclusions	Operations/Support staff	35		Other	48	Total	408	100,0

The respondents belonged to **200 different organizations**.

Siz	Size of the organizational unit						
Employees	n	%	Cumulative %				
1-10	93	23,8	23,4				
11-50	141	35,4	58,8				
51-100	66	16,6	75,4				
101-200	44	11,1	86,4				
201-500	28	7,0	93,5				
501-1000	16	4,0	97,5				
More than 1000	10	2,5	100,0				
Total	398	100,0					

- Respondents mainly were developers and project managers
- Quite experienced in software development
- Organizational unit size rather small





Level of Agile and Lean usage

e suge e	right and Lean is	it mous	_	
Agile and Lean usage	n	%		
Only Agile	137	33,6		
Agile and Lean	88	21,6		
Only Lean	11	2,7		
No Agile or Lean	172	42,2		
Total	408	100,0		

Usage of Agile and Lean Methods

Strong position that Agile methods in software development

Lean appears as a new player being used by 24% of respondents, mainly in combination with Agile (21%)

Earlier studies have reported much lower levels of Lean usage (around 2%)





Usage of specific Agile methods and practices

	Usage of specific agile methods			Usage of specific agile	e practice	S	
	Methods	n	%	Practices	n	Mean	Median
Agile and Lean	Scrum	196	83,1	Prioritized work list	204	4,2	4
Development	Extreme Programming (XP)	43	18,1	Iteration/sprint planning	203	4,1	4
	Agile Modeling	27	11,4	Daily stand-up meetings	209	3,7	4
Study Design	Feature-Driven Development (FDD)	21	8,9	Unit testing	199	3,7	4
	Kanban	11	4,7	Release planning	196	3,9	4
	Adaptive Software Development	10	4,2	Active customer participation	196	3,5	4
Results	Dynamic Systems Development Method (DSDM)	6	2,5	Self-organizing teams	194	3,5	4
	TDD	4	1,7	Frequent and incremental delivery of	189	4.1	4
Conclusions,	Crystal Methods	2	0,8	working software			
Limitations and	Other	18	7,6	Automated builds	185	3,5	4
				Continuous integration	182	3,8	4
				Test-driven development (TDD)	179	2,7	3
	- Scrum clearly the most wid			Retrospectives	177	3,6	4
	method	Cry O	300	Burn-down charts	174	3,2	3
	memou	Pair programming	174	2,4	2		
				Refactoring	163	3.4	3
	- Kanban and TDD repo	rted	as	Collective code ownership	159	3,3	3
	methods by the respondents	S		Other	9	1,8	1

Results of Agile practices in use well aligned with earlier studies



Usage of Lean principles

Agile and Lean	Usage of specific lean principles							
Development		Principles	n	Mean	Median			
		Focus on creating customer value	209	3,9	4			
Study Design		Eliminate waste and excess activities	199	3,4	3			
		Create a culture of continuous	198	3,5	4			
		improvement						
Results		Do it right the first time	196	3,4	3			
		Respect and empower people	190	3,8	4			
Conclusions, Limitations and		Minimize inventory or work in progress	189	3,2	3			
Future work		Pull from demand	184	3,6	4			
		Focus on optimizing the whole system and not only local optimizations	181	3,3	3			
		Continuous flow of small batches in the development process	179	3,5	4			
		Make decisions as late as possible	175	3,0	3			
		Root source analysis is done after problems are discovered	174	3,2	3			
		Look simultaneously for multiple solutions	174	3,2	3			
		Create trusted relationships with suppliers	165	3,6	4			
		Create cadence	147	2.9	3			



"Whether the component comes from an in-house Toyota factory or a supplier makes no difference. Toyota engineers are responsible."



	Goals in agile and lean adoption				
_	Goals	n	%		
Aaile and Lean	To increase productivity	158	66,9		
Software	To improve product and service quality	145	61,4		
Development	To reduce development cycle times and time-to-market	137	58,1		
Study Design	To improve process quality	113	47,9		
	To increase the ability to adapt to changes in the business environment	110	46,6		
	To improve team communication	100	42,4		
Results	To improve development flow	99	41,9		
	To reduce risks	86	36,4		
Conclusions,	To remove waste and excess activities	75	31,8		
Limitations and	To decrease development costs	75	31,8		
	To improve customer understanding	65	27,5		
	To create transparency within the organization	63	26,7		
	To improve stakeholders' satisfaction	57	24,2		
	To improve organizational learning	45	19,1		
	To improve the management of business/product value	42	17,8		
	To establish team-wide project comprehension	33	14,0		
	To improve our understanding of the whole value stream	31	13,1		
	To achieve success others have achieved using lean methods	27	11,4		
	Other	6	2,5		

Companies' goals in adopting Agile and Lean and effects of its usage

Effects of adoption of agile and lean Effect Mean Median n Improved team communication 204 4,0 4 Enhanced ability to adapt to 203 3.9 4 changes Increased productivity 201 3,8 4 Enhanced process quality 198 3,7 4 Improved learning and 197 3,7 4 knowledge creation Enhanced software quality 3,8 196 4 Accelerated time-to-192 3,7 4 market/cycle time Reduced waste and excess 190 3,5 4 activities Improved customer 3,7 190 4 collaboration Improved organizational 187 3,5 4 transparency Improved customer 188 3,7 4 understanding Reduced risks 3 184 3,4 Improved alignment between IT 3 180 3.4 and business objectives Enhanced value creation 178 3,6 4 Improved stakeholder 169 3.6 4 satisfaction Reduced costs 163 3,2 3 13 4 Other 3.8

Challenges and limitations in the usage of Agile and Lean

Limitations in agile and lean adoption

	Challenges	n	Mean	Median	Limitations
Aglie and Lean Software	Top management commitment	201	4,0	4	Limited support for deve
Development	Customer/supplier collaboration	192	3,9	4	large, complex software
Study Design	Cultural change/translating agile/lean principles from development teams to the rest	190	3,8	4	Limited support for development involving la teams
	of the business				Limited support for sub-
Poculto	Measuring agile/lean success	190	3,6	4	contracting
Kesuiis	Resistance to change	186	3,6	4	Limited support for
	Defining business value	184	3,9	4	development involving le
Conclusions,	Need for specialized skills	183	3,1	3	systems
Limitations and Future work	Tailoring agile/lean practices	182	3,5	4	development environmer
	Lack of formal guidelines	176	2,8	3	Limited support for build
	Inadequate documentation	175	3,2	3	reusable artifacts
	Scalability of agile/lean methods	174	3,6	4	Limited support for deve
	Inadequate training	174	3,3	3	Other
	Synchronizing activities	172	3,4	4	Ouler
	Synchronizing activities	168	3,5	4	
	Loss of management control	168	2,8	3	Top challenge
	Lack of big design up front	167	3,0	3	
	Fixed price contracts	161	3,3	3	– Top manad
	Steep learning curve	159	3,1	3	
	Inappropriateness of existing	158	3,1	3	- Customer/s
	technologies/tools				- Cultural ch
	Achieving flow	157	3,5	4	
	Decreased predictability	155	3,1	3	- Measuring
_	Other	12	3,2	3	

Challenges in agile and lean adoption

Limitations	n	Mean	Median
Limited support for developing large, complex software	189	3,3	3
Limited support for development involving large teams	185	3,1	3
Limited support for sub- contracting	181	2,8	3
Limited support for development involving legacy systems	179	3,1	3
Limited support for distributed development environments	178	2,9	3
Limited support for building reusable artifacts	176	3,0	3
Limited support for developing safety/mission-critical software	174	2,9	3
Other	16	3,3	3

es

- gement commitment
- supplier collaboration
- ange
- Agile/Lean success







Non-adopter's reasons and plans to adopt agile and lean methods

Agile and Lean Software Development

Study Design

Results

Conclusions, Limitations and Future work The survey responses included also 137 practitioners in whose organizational units agile or lean methods were not in use

Why did they not consider these methods appropriated for their software development?

Reasons for not adopting	n	%	
Lack of knowledge and training	64	46,7	
Too traditional organizational culture	59	43,1	
Lack of support or commitment from the	28	20,4	
management			
Fixed price contracts	25	18,2	
Customers are not ready for agile/lean methods	22	16,1	
Resistance to change	18	13,1	
Inappropriate technology and tools	17	12,4	
Incompatible business domain (please specify your business domain)	12	8,8	
The burden of changing to agile/lean methods	10	7,3	
Lack of quality assurance procedures	10	7,3	
Unstable project requirements	9	6,6	
Lack of progress-tracking mechanism	9	6,6	
Our organization lacks customer understanding	7	5,1	
Lack of scalability	6	4,4	
Lack of support for reward system	6	4,4	
Lack of big design up front	6	4,4	
Limited support for building reusable artifacts	3	2,2	
Limited support for distributed development environments	3	2,2	
Decreasing predictability	2	1,5	
Other	27	19.7	

Do they have plans for adopt agile or lean in the near future?

Planned adoption	n	%
Within a year	14	10,2
Within two years	8	5,8
Not planned	52	38,0
Don't know	63	46,0
Total	137	100,0

What methods do they plan to adopt?

Planned methods	n	%
Scrum	19	90
Lean Software Development	3	14
Agile Modeling	2	10
Extreme Programming (XP)	1	5
Dynamic Systems Development Method (DSDM)	0	0
Feature Driven Development (FDD)	0	0
Crystal Methods	0	0
Adaptive Software Development	0	0
Other	3	14





Conclusions

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- The majority of respondents' organizational units are using Agile and/or Lean methods (58%).
- There is an interest of combining Agile and Lean approaches
 - Agile is not abandoned when Lean is adopted
 - The transformation is being actually conducted as a single trip where the borders between agile and lean are not clearly defined
- Main Lean principles in usage:
 - Focus on customer value
 - Eliminate waste
 - Continuous improvement
- Main **benefits**:
 - Improved team communication
 - Enhanced ability to adapt to changes
 - Increased productivity
- Challenges and limitation were also identified
 - Challenges: obtaining management support
 - Limitations: developing large and complex software

- Main practices in usage:
 Drigritized work list
 - Prioritized work list
 - Iteration/sprint planning
 - Daily stand-up meetings



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Limitations and Future work

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LIMITATIONS

- Although we consider the Finnish Software industry as a suitable population for the study the generalization of the results is still limited
- The confusion and inconsistency in how agile and lean are understood ٠ can impact the results of the study

FUTURE WORK

- To replicate the study using other samples (for example from other countries)
- To conduct case studies that allow a deeper understanding of the phenomenon of agile and lean transformation in software intensive companies

 - Value and waste in software development Measuring Lean and Agile 's impacts Software lean enterprise including suppliers and customers
 - Cultural and organizational change





http://www.cloudsoftwareprogram.org/

group



Letter Artel Com



http://www.oulu.fi/yliopisto/

Thank you!

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